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of a text of this sort, in special investigations will show whether errors and omissions are sufficiently numerous to impair the value of a book that is certainly the fruit of monumental labor.—E. O. JORDAN.

A volume of Saccardo's *Sylloge*.

THE ACTIVITY of cryptogamic botanists is well shown by the recent issue of another volume supplementing Saccardo's great work enumerating all known fungi.⁴ The volume has been prepared with the assistance of Dr. P. Sydow, and contains descriptions of species of fungi published during the four years closing with 1898. It was at first thought that an annual supplementary reference list of new species, omitting descriptions, would sufficiently meet the needs of working botanists, and three such lists were published in *Hedwigia*. But the great number of species constantly appearing makes the desirability of a volume like the present one beyond all dispute.

The species issued during the period of four years attained very nearly the enormous number of five thousand. This brings the total number of species described in twelve volumes of the *Sylloge*, two additional volumes being devoted to indexes, up to 47,304.

Next to the convenience of possessing all specific and generic descriptions is that of good indexes, and in these the *Sylloge* is not wanting. The present volume is supplied with a full index of species and of hosts, together with one of the genera and higher divisions contained in all the fourteen volumes.

Much critical acumen has been shown in compiling the work, and many duplications of species or of names have been rectified. There also appear descriptions of twenty-nine species not before published.

A novel and interesting feature of the work is the tabulation for easy comparison of all the genera of the *Sylloge*, arranged according to the complexity of structure of the spores. This part occupies sixty-two pages.

Altogether the work is one of great value to the student of systematic mycology. So long as new species continue to be issued by the thousand yearly, botanists cannot be too grateful for helps of this kind.

The volumes may be obtained through book dealers, or by addressing the senior author at Padua, Italy.—J. C. A.

NOTES FOR STUDENTS.

PROFESSOR ROBERT A. HARPER⁵ has published the results of his researches on cell-division in sporangia. These investigations were a natural

⁴SACCARDO, P. A. and SYDOW, P.: *Sylloge fungorum omnium hucusque cognitorum digessit, P. A. Saccardo*; vol. XIV, supplementum universale Pars iv. Adjectus est index totius operis. 8vo. pp. 1316. Patavii, 1899. 83 francs.

⁵HARPER, ROBERT A.: Cell-division in Sporangia and Asci. *Annals of Bot.*, 13:467. 1899.

outcome of his studies upon the ascus, and the conclusions are of great interest in relation to the problem of the origin of that organ and the group of fungi characterized by its presence. Harper studied the sporangium of *Synchitrium*, *Pilobolus*, and *Sporodinia*, and found the method of cell-division essentially similar in all forms.

The protoplasm of the sporangium becomes divided by "cleavage furrows" that start from the plasma membrane (*Hautschicht*) or from vacuoles. The cleavage is progressive and gradual, and in large sporangia very irregular, separating masses of multinucleate protoplasm of varying sizes. The cleavage furrows divide the protoplasm in a manner aptly termed "cleavage by constriction," and should be carefully distinguished from free cell formation. In cleavage by constriction there can be no epiplasm, and the process is initiated from the plasma membranes, either on the outside of the sporangium or around the vacuoles. This fact indicates that these two forms of plasma membranes are more closely related than may be generally believed.

True free cell formation is illustrated by the development of spores in the ascus. Here areas of protoplasm around the nuclei are cut out from the general mass of cytoplasm by the activity of the fibrillæ of an aster, and such fibrillæ are of course identical with the fibers that make up the spindle of a nuclear figure. These fibrillæ bend down and around the nucleus from the center of the aster and cut out a region of cytoplasm, which later becomes more definitely bounded by the spore wall. After spore formation there is left in the ascus a quantity of epiplasm, which, having no nuclei, must finally become disorganized.

The importance of these investigations to the problems of the relationships of ascus and sporangium cannot be stated too strongly. To one who believes firmly in the great value of comparative cytological studies as a test of relationship between groups of plants, the evidence seems overwhelming against the views advanced by Brefeld. It would be almost inconceivable that two homologous organs, such as some suppose the sporangium and ascus to be, could present protoplasmic activities of such diverse characters. The entire trend of cytological phenomena is against such a hypothesis. These investigations furnish perhaps the most striking instance of the value of cytological work as an aid and safeguard in speculation upon problems of plant phylogeny.

The paper also discusses several other topics of interest and value, but the most important conclusions are perhaps those outlined above.—B. M. DAVIS.